



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/683,267	12/06/2001	Joanna L. Duncan	AL.US.9	3355

23731 7590 11/02/2004

DECKER LAW OFFICE  
1 NEW HAMPSHIRE AVE.  
SUITE 125  
PORTSMOUTH, NH 03801

EXAMINER

LISH, PETER J

ART UNIT	PAPER NUMBER
----------	--------------

1754

DATE MAILED: 11/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/683,267

Applicant(s)

DUNCAN ET AL.

TH

Examiner

Peter J Lish

Art Unit

1754

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 03 August 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-4 and 6-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,6-12 and 14-16 is/are rejected.
- 7) ☒ Claim(s) 3 and 13 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION*****Response to Arguments***

Applicants additionally argue that the electron beam oxidation means converts too much SO<sub>2</sub> to SO<sub>3</sub> and therefore cannot achieve a mole ratio of SO<sub>2</sub> to NO<sub>2</sub> of at least 2.5 to 1. However, the ratio of SO<sub>2</sub> to NO<sub>2</sub> remaining in the gas stream after conversion does not depend upon the conversion products. Rather the gas ratio resulting from the oxidation step depends upon the ratios of the gases before the oxidation as well as their respective conversion rates. As stated in the previous office action, the applicant states that in known electron beam oxidation processes, up to 50% of the SO<sub>2</sub> is converted when 90% of the NO is converted. It is additionally taught by Aoki et al. that the flue gas being treated contains, on average, a ratio of SO<sub>x</sub> to NO<sub>x</sub> of 5 to 1. Therefore, it is expected that after oxidation treatment, even at the highest rate of SO<sub>2</sub> conversion, the gas will have a ratio of SO<sub>2</sub> to NO<sub>2</sub> of at least 2.5 to 1. *The FINALITY is withdrawn in view of the rejections which follow.*

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 6-7, 9-12, and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki et al. (USPN 5,041,271) taken with Senjo et al. (USPN 4,035,470).

Art Unit: 1754

Aoki et al. disclose a process wherein waste gas containing  $\text{SO}_x$  and  $\text{NO}_x$  are subjected to oxidation by electron beam irradiation, then reacted with ammonia to form ammonium sulfate and ammonium nitrate. The ammonium sulfate and ammonium nitrate are then removed from the system using an electrostatic precipitator.

Aoki et al. does not explicitly teach the ratio of  $\text{SO}_2$  to  $\text{NO}_2$  present after oxidation, however, it does teach that the average ratio of  $\text{SO}_x$  to  $\text{NO}_x$  of the waste gas mixture is about 5:1 (column 6, lines 65-66). Therefore, it is expected that after oxidation treatment, the gas will have a ratio of  $\text{SO}_2$  to  $\text{NO}_2$  of at least 2.5 to 1 because it is expected that the  $\text{SO}_2$  not be oxidized at a rate more than twice that of the  $\text{NO}_2$ . Additionally, it is expected that the process of Aoki et al. may be performed so as to have different oxidizing potentials, i.e. performing oxidation for different lengths of time, and that the gases treated by the process of Aoki et al. may vary in their  $\text{SO}_2$  to  $\text{NO}_2$  ratios. Therefore, while Aoki does not explicitly teach the gas concentrations after oxidation, it is held that where, as here, the reference discloses all the limitations of a claim except a property or function, and the examiner cannot determine whether or not the reference inherently possesses properties which anticipate or render obvious the claimed invention, the burden of proof is shifted to the applicant, as in *In re Fitzgerald*, 619 F.2d 67, 205 USPQ 594 (CCPA 1980).

Aoki et al. do not explicitly teach that the ammonia be introduced as a scrubbing solution with a specific pH. Senjo et al. disclose a process wherein sulfur oxides and nitrogen oxides are removed from waste gas by oxidizing NO to  $\text{NO}_2$  and then scrubbing the gas with an aqueous scrubbing solution containing ammonium sulfite in order to produce ammonium sulfate and ammonium nitrate. The pH of the scrubbing solution is preferably in the range from 6.5 to 8.5

Art Unit: 1754

(column 4, lines 39-45). It would have been obvious to one of ordinary skill at the time of invention to use a scrubbing solution containing ammonia to react with the acid components of the waste gas, as taught by Aoki et al., and further containing ammonium sulfite at a pH of between 6.5-8.5 to react with the  $\text{NO}_2$  and  $\text{SO}_2$  components, as taught by Senjo et al. in the process of Aoki et al. in order to ensure a more complete removal of the gaseous pollutants. It is noted that the scrubbing solution will also contain ammonium sulfate, as it is the product of both the reaction of ammonia with the acid components and of ammonium sulfite with the  $\text{NO}_2$  and  $\text{SO}_2$  components.

Aoki et al. do not disclose that Hg present in the waste gas may be treated by the system. However, no difference is seen between the process of Aoki taken with Senjo and that of the instantly claimed invention that would prevent the process of Aoki and Senjo from removing mercury impurities, which are known to be present in combustion, exhaust gases. It is thereby expected that the process of Aoki and Senjo oxidizes and removes Hg as well as  $\text{SO}_x$  and  $\text{NO}_x$ .

Claims 8 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki et al. taken with Senjo et al. as applied to claims 1 and 11 above, and further in view of Helfritsch et al. (US 5,695,616).

Aoki et al. teaches the use of an electrostatic precipitator for the removal of the ammonium sulfate and ammonium nitrate. Aoki et al. does not explicitly teach whether the electrostatic precipitator is of the wet or of the dry variety. Helfritsch et al. teaches an almost identical process involving the electron beam oxidation of  $\text{SO}_x$  and  $\text{NO}_x$  in exhaust gases, the reaction with ammonia to form ammonium sulfate and ammonium nitrate, and the collection of

Art Unit: 1754

these compounds by a wet electrostatic precipitator. It would have been obvious to one of ordinary skill at the time of invention to have used the wet electrostatic precipitator of Helfritch et al. in the process of Aoki et al. taken with Senjo et al., because it is seen to achieve the desired effect of collecting the ammonium sulfate and ammonium nitrate reaction products.

***Allowable Subject Matter***

Claims 4 and 13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter J Lish whose telephone number is 571-272-1354. The examiner can normally be reached on 9:00-6:00 Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.



PL

STUART L. HENDRICKSON  
PRIMARY EXAMINER